

Smoking behavior, initiating and cessation factors among Japanese nurses: A Cohort Study

T Kitajima¹, T Ohida¹, S Harano¹, AMM Kamal², S Takemura², N Nozaki¹, K Kawahara³ and M Minaowa⁴

¹Department of Public Health, School of Medicine, Nihon University, Tokyo, Japan; ²Department of Public Health Policy, National Institute of Public Health, Wako, Japan; ³Department of Health Policy Science, Graduate School of Medical and Dental Science, Tokyo Medical and Dental University, Tokyo, Japan; and ⁴Department of Epidemiology, National Institute of Public Health, Wako, Japan

The prevalence of smoking among Japanese nurses, specially in their twenties, is higher than that among the general female population. To examine smoking behavior, smoking initiating and cessation factors, we conducted a cohort study through questionnaire survey, targeting nurses ($n = 1572$) working at 11 hospitals located in Tokyo metropolitan area. The first survey was conducted using a confidential questionnaire on smoking, followed by a second survey conducted in the same manner on the same subjects two years later. As to smoking status after two years, 8% (95%CI = 1.5%) started smoking and 6% (95%CI = 1.4%) quitted resulting in a 2% increase in the prevalence of current smoking. The average nicotine dependence for nurses who were smokers in the two surveys rose from 3.9 to 4.3 ($P < 0.05$). Smoking behavior of mother, friends, or superiors at work had a significant influence on smoking behavior of nurses. As to smoking cessation factors, the idea that women and medical workers should not smoke, and living with family each had a significant influence. Considering the fact that 6% of nurses in this study succeeded in quitting smoking within two years, it is required that anti-smoking education be conducted at medical institutions to decrease the prevalence of current smoking among the nurses in Japan.

Public Health (2002) 116, 347–352. doi:10.1038/sj.ph.1900879

Keywords: smoking behavior; smoking cessation; nurses; cohort study; Japan

Introduction

The World Health Organization (WHO) has appealed to health professionals worldwide to deepen their understanding of effects of smoking on health, and behave accordingly.¹ Several studies on smoking behavior among nurses conducted in some developed countries have shown that the prevalence of smoking among nurses tends to be almost the same or higher than that in the general female population of the same age group.^{2–7}

In the USA and UK, anti-smoking campaigns targeting nurses were successfully conducted resulting in decreasing the smoking prevalence among nurses to a level as low as that among other health professionals,^{8–12} and now it is even lower than the prevalence of smoking among the general female population. In Japan, however, such campaigns have not yet been conducted. Research in Japan revealed a higher prevalence of smoking among nurses, particularly in their thirties and forties, and it was reported that nurses in their twenties were influenced by their senior.^{13,14}

In recent years, an increase in prevalence of smoking among women in their twenties has been reported in Japan.¹⁵ Reasonably this tendency also applies to nurses among whom the ratio of young women is quite high. The likelihood is that smoking behavior of nurses in their twenties gradually changes after they start working as nurses. We assume that taking anti-smoking measures for Japanese nurses whose number is estimated to be approximately one million,¹⁶ and among whom the prevalence of smoking is high, will contribute to decreasing the prevalence of smoking among the general female population in Japan.^{13,14}

So far, however, few surveys on smoking behavior of nurses have been conducted in Japan, most were cross-sectional studies, and no prospective cohort studies have yet been done. Our study therefore aims to conduct a cohort study on and analyze smoking behavior, initiation and cessation factors among young women working as nurses soon after graduation from nursing schools.

Methods

The study was conducted through questionnaire surveys at 11 university hospitals and national hospitals located in Tokyo metropolitan area. The subjects of this study were all 1572 nurses who started working at these hospitals in

*Correspondence: T Ohida, Department of Public Health, School of Medicine, Nihon University, Ohyamaguchikami-machi, Itabashi-ku, Tokyo 173-8610, Japan.
E-mail: tohida@iph.go.jp
Accepted 11 June 2002

1997 and 1998. The surveys were conducted over two years: The first surveys (hereinafter called the first survey) were conducted in July 1997 and 1998, and the second surveys (hereinafter called the second survey) were conducted in July 1999 and 2000. In the first survey, there were 1525 responses (return rate 97%) and after excluding 37 subjects who were male or whose gender was not stated in the questionnaire, the follow-up survey (the second survey) was conducted on 1488 subjects. In the second survey, we were able to obtain and analyze responses from 1195 subjects (follow-up rate 80%). The remaining subjects had either resigned from the hospitals (18%) or had not properly followed the procedures of the survey or not answered the questions on smoking (2%).

In both first and second surveys, the same confidential questionnaire, to be filled in by the subjects themselves, was used.

Items contained in the questionnaire were: 1) Smoking behavior ie current smoker or not; 2) eight items related to the Fagerstrom nicotine-dependency Scale^{17,18} and 3) five newly drafted items related to smoking status of the subject's surroundings (father, mother, siblings, friends, chief of the nursing division).

To protect the subjects' privacy, the double-envelope method, which had previously been used for a study on smoking behavior among nurses in Japan, was adopted.¹¹ However, in this study, it was necessary to follow up the changes in smoking behavior of each individual by using a confidential questionnaire. Therefore, the following method was used: 1) In the first surveys, each subject was requested to write in a five-digit number of her own choice on the questionnaire and write the same five-digit number on an enclosed small card. To avoid different subjects choosing the same numbers, subjects were advised to select five digits of different values and not to use consecutive numbers such as 12345; 2) each subject was then requested to put the small card into the envelope provided, seal it and write her name on the envelope. The questionnaire and the envelope with the card in it were collected separately; 3) in the second surveys, a new questionnaire with the same questions used in the first survey and an envelope with the same small card with the five-digit number written in the first survey were delivered to the corresponding subject; 4) the subject was requested to write in the same 5-digit number (written on the small card of the first survey) on the new questionnaire. Again the questionnaire and the envelope with the card were collected separately; and 5) finally, the two questionnaires with identical numbers written on them were compared and the results were analyzed.

For the statistical processing, SPSS for Windows was used, and χ^2 and *t*-tests were conducted to determine statistical significance. The significance level was set at 5% difference. To examine smoking initiating factors, a series of univariate logistic regression analyses were conducted with whether non-smokers ($n=816$) of the first survey started smoking by the second survey or not as a

dependent variable, and variables of eleven factors affecting smoking (attitude toward smoking, smoking status of surroundings, and life environmental conditions) written on the first survey's questionnaire as independent variables. Then a multiple logistic regression analysis with a stepwise elimination procedure was conducted with six variables (statistically significant five variables plus one of attitudes toward smoking as a variable). From these analyses, odds ratios and 95% confidence intervals were calculated.

In addition, a logistic regression analysis was also carried out on whether smokers ($n=379$) of the first survey quit smoking within the two years. Multiple logistic regression analysis was conducted with four variables, which had been selected in the following way: One from three items regarding attitude toward smoking and whose odds ratios as the results of the univariate logistic regression analyses were 2 or more; one item 'living alone', which had been revealed statistically significant; and two items regarding subjects' friends or superiors being current smokers which had been revealed statistically significant. The reason only one item among the three items regarding attitude toward smoking with odds ratio 2 or more had been selected as an independent variable was to avoid confounding.

'Current smokers' were defined to comprise daily and occasional smokers.

Results

The average age of the subjects of the study in the first survey was 22 y (s.d. 1.8). As to smoking status after two years, as shown in Table 1, 8% (95% CI $\pm 1.5\%$) started smoking and 6% (95% CI $\pm 1.4\%$) quit smoking, resulting in a 2% increase in prevalence of current smoking. Thus, the prevalence of current smoking among nurses who started working increased from 32% (95% CI $\pm 2.6\%$) to 34% (95% CI $\pm 2.7\%$) in two years.

The total number of nurses who answered that they were daily smokers for both the first and second surveys was 213, of which 211 answered to all 8 items of the Fagerstrom scale for nicotine dependency in both surveys, and the average score increased from 3.9 (s.d. 2.0) for the first survey to 4.3 (s.d. 2.3) for the second survey (*t*-test, $P < 0.05$). In addition, that of daily smokers in the first survey who quit smoking in two years was 3.3 (s.d. 1.7, $n=29$).

In the multivariate logistic regression analysis shown in Table 2, as smoking initiating factors, no concern about harmful effects of passive smoking and the fact that the mother, friends, or superiors at work were smoking, were proved to be statistically significant. As to factors related to first-survey smokers quitting before the second survey, the idea that health professionals should not smoke and living with the family were proved to be statistically significant. However, in this study, subjects' experience of having tried to quit smoking did not become a smoking cessation factor.

Table 1 Self-reported smoking status and its changes among Japanese female nurses in two years

Smoking status	First survey	Second survey
Current smokers	32% ($\pm 2.6\%$)	34% ($\pm 2.6\%$)
Daily smokers	21% ($\pm 2.3\%$)	23% ($\pm 2.4\%$)
Occasional smokers	11% ($\pm 1.7\%$)	10% ($\pm 1.7\%$)
Past smokers	23% ($\pm 2.4\%$)	27% ($\pm 2.5\%$)
Never smokers	45% ($\pm 2.8\%$)	39% ($\pm 2.8\%$)
Total	100% ($n = 1195$)	100% ($n = 1195$)
Changes in smoking status		
Continued smokers	26% ($\pm 2.5\%$)	
($n = 306$)	8% ($\pm 1.5\%$)	
New smokers ($n = 95$)	6% ($\pm 1.4\%$)	
Quitters ($n = 73$)	60% ($\pm 2.8\%$)	
Non-smokers ($n = 721$)	100%	
Total ($n = 1195$)		

(): 95% Confidence Interval (CI).

First survey: The survey done in July 1997 and 1998.

Second survey: The survey done in July 1999 and 2000.

Continued smokers: Habitual smokers in both the first and second surveys.

New smokers: Non-smokers in the first survey and habitual smokers in the second survey.

Quitters: Habitual smokers in the first survey and non-smokers in the second survey.

Non-smokers: Non-smokers in both the first and second surveys.

When comparing factors in smoking initiation/cessation whose results of univariate analyses were significant in Tables 2 and 3, between the followed up group and the non-followed up group, no factor was proved to be statistically significant (Table 5).

As to change in attitude toward smoking among all the subjects, as shown in Table 4, more people took a positive attitude toward smoking (two out of six items were statistically significant) in two years. A comparison between smokers and non-smokers showed that the number of smokers who had a positive attitude toward smoking was significantly larger.

Discussion

As previous studies on smoking behavior of nurses in Japan were cross-sectional, this cohort study on smoking behavior of nurses is considered to be very valuable. To our knowledge, even in the USA and UK, where anti-smoking measures toward health professionals are advanced, no cohort study on factors related to smoking initiation and cessation among nurses has been conducted.

From the results of this study, it is assumed that whether subjects started smoking or not was strongly related to whether the subjects' mothers friends, or superiors were smokers or not (Table 2). As to influence from friends and colleagues, some reports have already revealed the same results,^{7,19-21} although they were all cross-sectional studies. As the same results were proved in this cohort study, the data deserve to be fully recognized. Influence of mothers on subjects' smoking was reported by another cross-sectional study on smoking behavior of Italian medical and nursing students.²² As the subjects of our study were in their early twenties like the subjects of the Italian study,²² influence of the mother can be strongly probable as initiating factor. In addition, it was revealed in this study that for non-smokers

Table 2 Regression analysis of risk factors for smoking at first survey among Japanese female nurses $n = 816$ (New smokers: $n = 95$, non-smokers: $n = 721$)

Factors at the first survey	Prevalence of risk factors	Odds ratio	95% CI
Univariable logistic regression analysis			
I dislike cigarette smoking in the workplace (Yes)/Other	35%	0.55	0.34–0.90
I'm concerned with harmful effect of passive smoking (Yes)/Other	78%	0.49	0.31–0.77
Women may smoke without distinction from men (Yes)/Other	19%	0.57	0.31–1.08
Women should not smoke for common sense (Yes)/Other	36%	0.37	0.64–1.12
Nurses should not smoke as medical professional (Yes)/Other	22%	0.60	0.33–1.08
My father smokes now/not	48%	1.41	0.71–2.83
My mother smokes now/not	12%	1.89	0.79–4.50
My siblings smoke now/not	25%	1.34	0.64–2.82
My friends smoke now/not	42%	2.63	1.28–5.40
My chiefs smoke now/not	25%	2.42	1.04–5.62
I live alone/not	54%	0.89	0.44–1.77
Multiple logistic regression analysis			
I dislike cigarette smoking in the workplace (Yes)/Other		0.68	0.40–1.14
I'm concerned with harmful effect of passive smoking (Yes)/Other		0.54	0.33–0.86
Nurses should not smoke as medical professional (Yes)/Other		0.75	0.40–1.39
My mother smokes now/not		2.06	1.15–3.71
My friends smoke now/not		1.72	1.03–2.86
My chiefs smoke now/not		1.95	1.03–3.71

95% CI: 95% Confidence interval.

Table 3 Regression analysis of smoking cessation factors at first survey among Japanese female nurses. $n=379$ (Quitter: $n=73$, continued smokers: $n=306$)

Factors at the first survey	Prevalence of risk factors	Odds ratio	95% CI
Univariable logistic regression analysis			
I have tried to quit smoking (Yes)/Other	81%	1.00	0.50–1.99
I have seriously tried to quit smoking (Yes)/Other	38%	0.93	0.55–1.60
I dislike cigarette smoke in the workplace (Yes)/Other	21%	1.66	0.93–1.65
I'm concerned with harmful effect of passive smoking (Yes)/Other	64%	0.97	0.57–1.65
Women may smoke without distinction from men (Yes)/Other	8%	2.84	1.28–6.31
Women should not smoke for common sense (Yes)/Other	63%	2.57	1.04–6.37
Nurses should not smoke as medical professional (Yes)/Other	9%	2.18	1.01–4.71
My father smokes now/not	48%	0.97	0.58–1.61
My mother smokes now/not	12%	1.72	0.92–3.21
My siblings smoke now/not	25%	0.78	0.47–1.30
My friends smoke now/not	42%	0.66	0.32–1.33
My chiefs smoke now/not	25%	0.79	0.39–1.57
I live alone/not	54%	0.55	0.31–0.96
Multiple logistic regression analysis			
Nurses should not smoke as medical professional (Yes)/Other		2.25	1.03–4.93
My friends smoke now/not		0.72	0.34–1.49
My chiefs smoke now/not		0.87	0.42–1.80
I live alone/not		0.54	0.31–0.95

95% CI: 95% Confidence interval.

Table 4 Changes in attitude toward smoking, and attitudes by smoking status over 2 years among Japanese female nurses

Opinions	Change over 2 years (<i>n</i> = 1195)			Attitudes at Year 1 Smoker Non-smoker			Attitudes at Year 2 Smoker Non-smoker		
	Year 1	Year 2	Sig.	(<i>n</i> = 379)	(<i>n</i> = 816)	Sig.	(<i>n</i> = 401)	(<i>n</i> = 794)	Sig.
Women should not smoke for the sake of fetus and infant's health (Yes)	89%	87%	NS	87%	90%	NS	84%	89%	*
Women should not smoke for common sense (Yes)	16%	15%	NS	8%	19%	NS	10%	18%	**
Women may smoke without distinction from men (Yes)	45%	49%	*	63%	36%	NS	63%	41%	**
Nurses should not smoke as medical professional (Yes)	18%	15%	NS	9%	22%	NS	7%	19%	**
Even medical professionals may smoke after working hours (Yes)	78%	80%	NS	87%	73%	NS	85%	78%	**
Nurses may smoke just as many other professionals do (Yes)	49%	57%	NS	63%	43%	NS	65%	52%	**

 χ^2 -test: ** $P < 0.01$, * $P < 0.05$, NS: not significant.

Year 1: The first survey.

Year 2: The second survey.

Sig.: Significant.

of the first year, having concern to passive smoking functioned repressively on initiating of smoking, and this is easily assumable.

In this study, it became clear that a negative idea on smoking and living with one's family were significant factors for smokers at the beginning of the survey to quit smoking (Table 3). Naturally, acquiring a negative idea on smoking would lead smokers to quit smoking. It could also be assumed from the results of this study that living with the family could be a factor for smokers to quit smoking. This assumption agreed with Swenson's report that the encouragement of nurses' families was the

most influential external factor motivating nurses to quit smoking.²³ In addition, Ohida *et al*²⁴ pointed out that the traditional three-generation family commonly seen in Asia contributed to decreasing the prevalence of smoking among women. They concluded that the reason for the low prevalence was that women tended to receive pressure from other members of the family not to smoke, but that men did not. Ohida *et al*²⁴ also estimated that the prevalence of smoking among Japanese women would increase as the number of women living alone increased with the collapse of the traditional Japanese extended family. These results are inconsistent with those of the

Table 5 Comparison of baseline (the first survey) initiating and cessation factors for smoking among followed-up and lost to follow-up groups

	Smoker		Significance
	Followed up group (n = 379)	Lost to follow-up group (n = 136)	
Cessation factors			
Women may smoke without distinction from men (Yes)	8%	5%	NS
Women should not smoke for common sense (Yes)	63%	65%	NS
Nurses should not smoke as medical professional (Yes)	9%	7%	NS
I live alone (Yes)	38%	40%	NS
Non-smoker			
	Followed up group (n = 816)	Lost to follow-up group (n = 251)	Significance
Risk factors			
I dislike cigarette smoking in the workplace (Yes)/Other	35%	39%	NS
I'm concerned with harmful effect of passive smoking (Yes)/Other	78%	72%	NS
My mother smokes now (Yes)	11%	12%	NS
My friends smoke now (Yes)	63%	65%	NS
My chiefs smoke now (Yes)	79%	77%	NS

χ^2 -test {2 (Yes, No) \times 2 (Followed up, Lost to follow-up) table}; NS: not significant.

present cohort study. Subjects' attempts to quit smoking in the past was not shown to be a smoking cessation factor in this study (Table 3), and that could be explained by a fact reported by Harrup *et al*²⁵ that most smokers who quit restart smoking.

The average score for the nicotine dependency of daily smokers rose from 3.9 to 4.3 in two years in this study. The evaluation of nicotine dependency in this study used the Fagerstrom Tolerance Questionnaire, in which scores of 7 or more are defined as highly dependent, and scores 4–6 as moderately dependent.¹⁸ Therefore, the average dependency in the present study rose to moderately dependent in two years. To know to what extent the dependency rises, it is necessary to continue the study.

As to attitudes of nurses toward smoking, as shown in Table 4, the percentage of nurses who accepted smoking more in the second year than in the first year was greater. From a statistical point of view, the subjects showed significant acceptance of smoking for two items. Therefore, acceptance of smoking may be a reason for 8% of nurses to initiate smoking in two years.

There were two limitations in the study. First, 20% of nurses could not be followed up. However, when comparing the followed up group and the non-followed up group about the smoking initiating factors and cessation factors, a significant difference was not observed, as shown in Table 5. Therefore, it could be assumed that actual rates of subjects who started smoking and who quit smoking would be similar to the results of this study. Second, as the selected facilities of this study were located in the Tokyo

metropolitan area, the results may not represent the whole country. However, a cross-sectional study conducted on nurses of all age brackets working at 14 national hospitals that were randomly sampled from 256 national hospitals nationwide reported the prevalence of smoking by age based on the question on age of starting and quitting smoking.²⁶ According to that study, the prevalence of smoking among nurses of any age brackets had increased during their late teens to age 30 at any of those 14 hospitals. The study suggested that the prevalence of smoking among Japanese nurses working at hospitals, whether in the countryside or in the Tokyo metropolitan area, continued to increase after they had started working at hospitals because of influence from friends or colleagues who smoked. However, as that study was a cross-sectional study, and there is a report of differences between recalled data and longitudinal recordings²⁷ cohort studies on those subjects should be conducted to verify whether the same current study done outside Tokyo metropolitan area will give the same results or not.

Lastly, the prevalence of smoking among young nurses in Japan increased in two years, and will also increase in the future as the prevalence of smoking among young Japanese women increases. In the USA however, the trend is reversed and the prevalence of smoking among nurses is decreasing year by year. Considering that 6% of subjects in this study succeeded in quitting smoking, it is necessary to start anti-smoking education in medical institutions, in order to decrease smoking prevalence among the nurses in Japan.

Acknowledgements

This research was supported in part by a Health Science Grant from the Ministry of Health and Welfare, Japan. The authors thank Hiroko Takizawa, Mie Kamata, Mayumi Hasegawa, Hiromi Sekine, and Kumiko Kawahara for helping in this study.

References

- World Health Organization. *Leave the Pack Behind*. World Health Organization: Geneva, Switzerland, May 1999, pp 33–39.
- Addiaanse H et al. Nurses' smoking worldwide: a review of 73 surveys of nurses' tobacco consumption in 21 countries in the period 1959–1988. *Int J Nurs Stud* 1991; 2: 313–322.
- Elkind AK. Do nurses smoke because of stress? *J Adv Nurs* 1988; 13: 733–745.
- Sacker A. Smoking habits of nurses and midwives. *J Adv Nurs* 1990; 15: 1341–1346.
- O'Connor AM, Harrison M. Survey of smoking prevalence among Canadian nursing students and registered nurses. *Can J Public Health* 1992; 83: 417–421.
- Hay DR. The smoking habits of nurses in New Zealand: results from the 1976 population census. *NZ Med J* 1980; 672: 391–393.
- Rausche JC, Hopp J, White R. Determinants of smoking behavior among nurses. *J Drug Education* 1987; 17: 365–377.
- Nelson DE et al. Trends in cigarette smoking among US physicians and nurses. *JAMA* 1994; 271: 1273–1275.
- Rowe K, Clark JM. The incidence of smoking amongst nurses: a review of the literature. *J Adv Nurs* 2000; 31: 1046–1053.
- Rowe K, Clark JM. Evaluating the effectiveness of a smoking cessation intervention for nurses. *Int J Nurs Stud* 1999; 36: 301–311.
- Becker DM et al. Smoking behavior and attitudes toward smoking among hospital nurses. *Am J Public Health* 1986; 76: 1449–1451.
- Feldman BM, Richard E. Prevalence of nurse smokers and variables identified with successful and unsuccessful smoking cessation. *Res Nurs Health* 1986; 9: 131–138.
- Ohida T et al. Smoking prevalence of female nurses in the national hospital of Japan. *Tobacco Control* 1999; 8: 192–195.
- Mori T. Smoking and medical professionals. *Nippon Koshu Eisei Zasshi* 1993; 40: 71–73 (in Japanese).
- Anon. *Nationwide cigarette smoking survey in 1998*. Japan Tobacco Industry Inc: Tokyo, 1988 (in Japanese).
- Ministry of Health and Welfare, Japan. *Annual Report on Health and Welfare 1997–1998*. Japan International Corporation of Welfare Services: Tokyo, 1999.
- Fagerstrom KO. Measuring degree of physical dependence to tobacco smoking with reference to individualization of treatment. *Addict Behav* 1978; 3: 235–241.
- Nakamura M, Ohshima A. Behavioral approach for smoking cessation. *Jap J Prim Care* 1991; 14: 29–37 (in Japanese).
- Padula CA. Nursing and smoking: Review and implication. *J Prof Nurs* 1992; 8: 120–132.
- Wagner TJ. Smoking behavior of nurses in western New York. *Nurs Res* 1985; 34: 58–60.
- Osaki Y, Minowa M. Cigarette smoking among junior and senior high school students in Japan. *J Adolescent Health* 1996; 18: 59–65.
- Melani AS et al. Tobacco smoking habits, attitudes and beliefs among nurses and medical students in Tuscany. *Eur J Epidemiol* 2000; 16: 607–611.
- Swenson IE. Smoking habits and smoking cessation among North Carolina nurses. *Women Health* 1989; 15: 29–47.
- Ohida T et al. Household size related to prevalence of smoking in women in Japan. *J Epidemiol* 2000; 10: 305–309.
- Harrup T, Hansen BA, Soghikian K. Clinical methods in smoking cessation: Description and evaluation of a stop smoking clinic. *Am J Public Health* 1979; 69: 1226–1231.
- Ohida T et al. Smoking prevalence of nurses in national hospital of Japan. *Nippon Koshu Eisei Zasshi* 1997; 44: 694–701 (in Japanese).
- Krall EA T et al. Accuracy of recalled smoking data. *Am J Public Health* 1989; 79: 200–202.